

## CLAIMS

1. Method for the operation of the rolling stands of a tandem cold rolling mill, comprising a pair of work rolls (10) and a pair of backup rolls (12) in the case of four-high rolling stands and, in addition, a pair of intermediate rolls (11) in the case of six-high rolling stands, wherein at least the work rolls (10) and the intermediate rolls (11) interact with axial shifting devices, characterized by the combined use of the following technologies within the multiple-stand tandem cold rolling mill:

- use of CVC/CVC<sup>plus</sup> technology with CVC roll contours of higher order, wherein each work roll/intermediate roll (10, 11) has a barrel lengthened by the amount of the shifting stroke;
- use of pair-cross (PC) technology, wherein each work roll/intermediate roll (10, 11) can be swiveled parallel to the plane of the strip;
- use of strip edge-oriented shifting of the work rolls/intermediate rolls (10, 11), wherein each work roll/intermediate roll (10, 11) has a barrel which is lengthened by the amount of the shifting stroke and which has a cylindrical or cambered cross section, and the work rolls/intermediate rolls

(10, 11) are each symmetrically shifted from the the neutral shift position ( $s_{ZW} = 0$  or  $s_{AW} = 0$ ) by the same amount symmetrically to the center of the stand (Y-Y) in the direction of their axes of rotation (X-X).

2. Method in accordance with Claim 1, characterized by the fact that, to use strip edge-oriented shifting, the work rolls/intermediate rolls (10, 11) are provided with a one-sided setback (d), such that when each work roll/intermediate roll (10, 11) is shifted, the beginning ( $d_0$ ) of the setback (d) is positioned outside the strip edge, at the strip edge, or inside the strip edge, i.e., within the width of the strip (14).

3. Method in accordance with Claim 1 or Claim 2, characterized by the fact that the shift position of the work roll/intermediate roll (10, 11) in different strip width ranges is predetermined by piecewise-linear step functions which are based on different positions of the beginning ( $d_0$ ) of the setback (d) relative to the edge of the strip (14).

4. Method in accordance with Claim 1, Claim 2, or Claim 3, characterized by the fact that optimum utilization of the combination of technologies within the multiple-stand tandem cold rolling mill is realized by optimized shifting strategies as a function of the strip width.

5. Tandem cold rolling mill, comprising four-high/six-high rolling mills, each with a pair of work rolls (10) and a pair of backup rolls (12) in the case of four-high rolling stands and, in addition, a pair of intermediate rolls (11) in the case of six-high rolling stands, wherein at least the work rolls (10) and the intermediate rolls (11) interact with axial shifting devices, characterized by the fact that the work rolls/intermediate rolls (10, 11) of the rolling stands each have a symmetrical barrel which is lengthened by the amount of the shifting stroke, has a cylindrical or cambered cross section, and is symmetrically positioned in the center of the stand (Y-Y) for the neutral shift position ( $s_{zw} = 0$  or  $s_{aw} = 0$ ).

6. Tandem cold rolling mill in accordance with Claim 5, characterized by the fact that the barrel of the work rolls/intermediate rolls (10, 11) is furnished with a one-sided setback (d), whose length (l) is divided into two adjacent regions (a) and (b), such that the first region (a), beginning with the radius ( $R_0$ ), obeys the equation of the circle

$$(l - x)^2 + y^2 = R^2,$$

and the region (b) runs linearly, from which the following setback (d) or the following diameter reduction (2d) is obtained for these regions:

Region a:

$$= (R^2 - (R - d)^2)^{1/2} \Rightarrow d = d(x) = R - (R^2 - (1 - x)^2)^{1/2}$$

Region b:

$$= 1 - a \Rightarrow d = d(x) = \text{constant.}$$

7. Tandem cold rolling mill in accordance with Claim 5 or Claim 6, characterized by the fact that the transition of the setback (d) between the regions (a) and (b) is made with a sequential setback of the dimension (d) resulting from roll flattening according to a predetermined table.

8. Tandem cold rolling mill in accordance with Claim 5, Claim 6, or Claim 7, characterized by the fact that suitable choice of the rolling stands allows a combination of the different technologies of

- strip edge-oriented shifting of the work rolls/intermediate rolls (10, 11).
- CVC technology, and
- swiveling of the work rolls (10), PC (pair cross) technology

within the multiple-stand tandem cold rolling mill.

9. Method in accordance with Claim 8, characterized by the fact that the CVC/CVC<sup>plus</sup> technology, the technology of strip edge-oriented shifting, and possibly PC technology are realized with only one geometrically identical set of rolls by means of suitable plant conception.